AGRICULTURAL
# Research
U.S. DEPARTMENT OF AGRICULTURE

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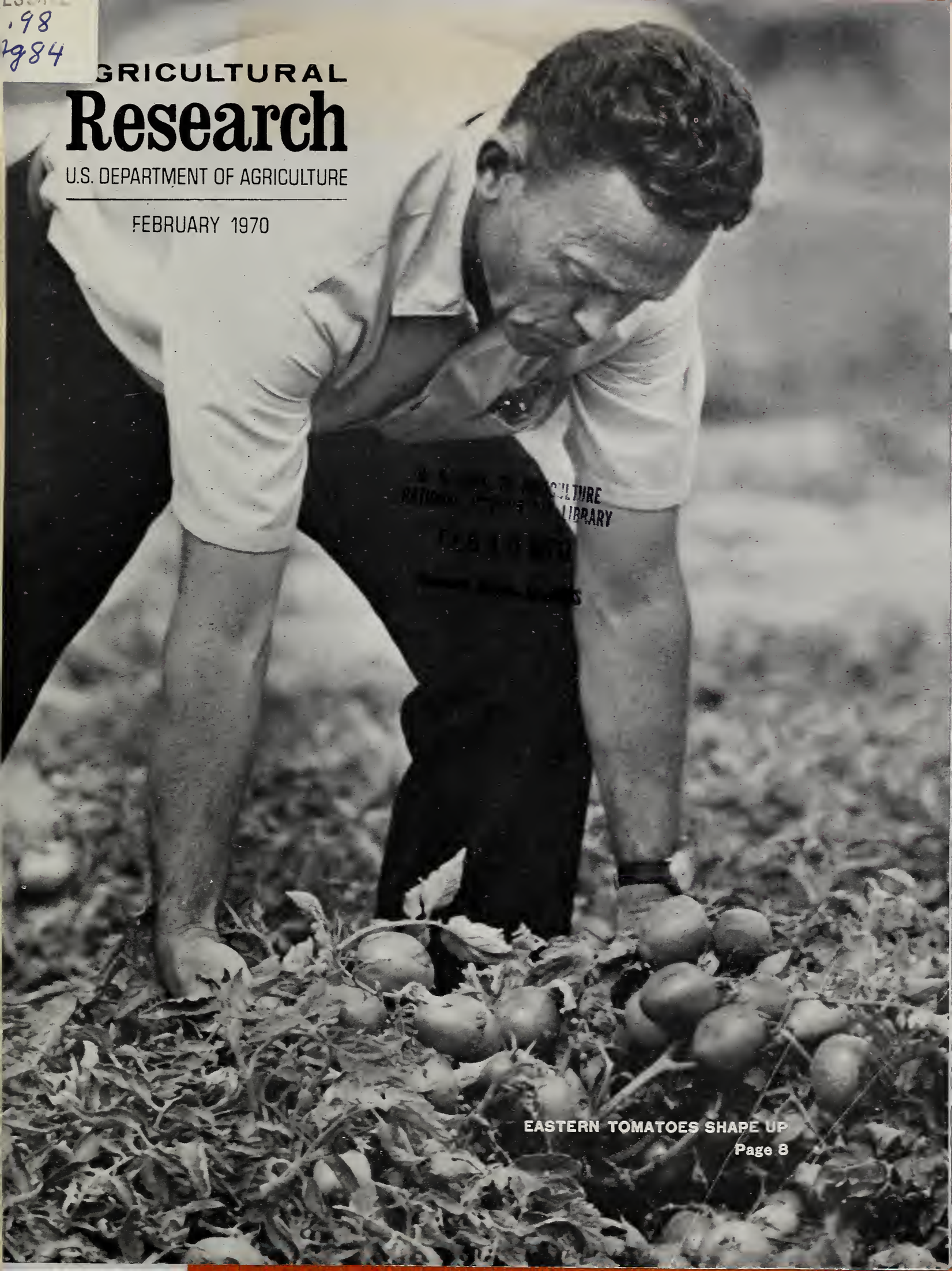



EASTERN TOMATOES SHAPE UP
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AGRICULTURAL
Research

*February 1970/Vol. 18, No. 8*

## Green Domains

As wintry nights close in, fires crackle in tune with the rustle of pages filled with glowing promises and magnificent photos. Gardeners everywhere are pouring over catalogs planning for the day when the pallid earth greens anew. So it is a fitting time to remind all anticipatory gardeners to get ready for National Lawn and Garden Week, which this year opens on March 20. Like these grand catalogs, this observance serves to encourage gardening, to guide the experienced, and to inspire the beginner.

Many of the garden wonders depicted in the catalogs rest on skills and lore that go back to antiquity. Modern gardeners can also draw upon the work of an army of scientists. Over the years ARS scientists and their colleagues have developed hundreds of new and improved varieties for our gardening pleasure. And they have searched the world for plants to beautify the American landscape.

In more basic research, ARS scientists are employing chemicals, lighting, growth chambers, and other means to probe the secrets of what makes plants grow and flower. Several findings are already in practical use. And as new knowledge is gained, it will help to further enhance the plantlife of tomorrow's lawns and gardens.

For gardeners and horticultural scientists can contribute greatly toward the task of making our communities more attractive places to live. In this period of concern about complex environmental problems, an individual working alone may feel powerless about improving the livability of his surroundings. Yet almost everyone can tend a garden. There he can influence the course of growth in one small domain, if only in a windowbox—as the designer who set its pattern, color, and fruitfulness. One effort makes but a ripple, but in unison with many other efforts it can swell to a wave.

The sensitive gardener knows that we need to live in alliance with nature, that we are servants as well as masters of our plots and fields. "Peace with the earth is the first peace," wrote Henry Beston who long studied the relationship of men and land. It is within the province of every gardener to add a bit of peace, order, and beauty to the world.



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**U.S. Department of Agriculture**

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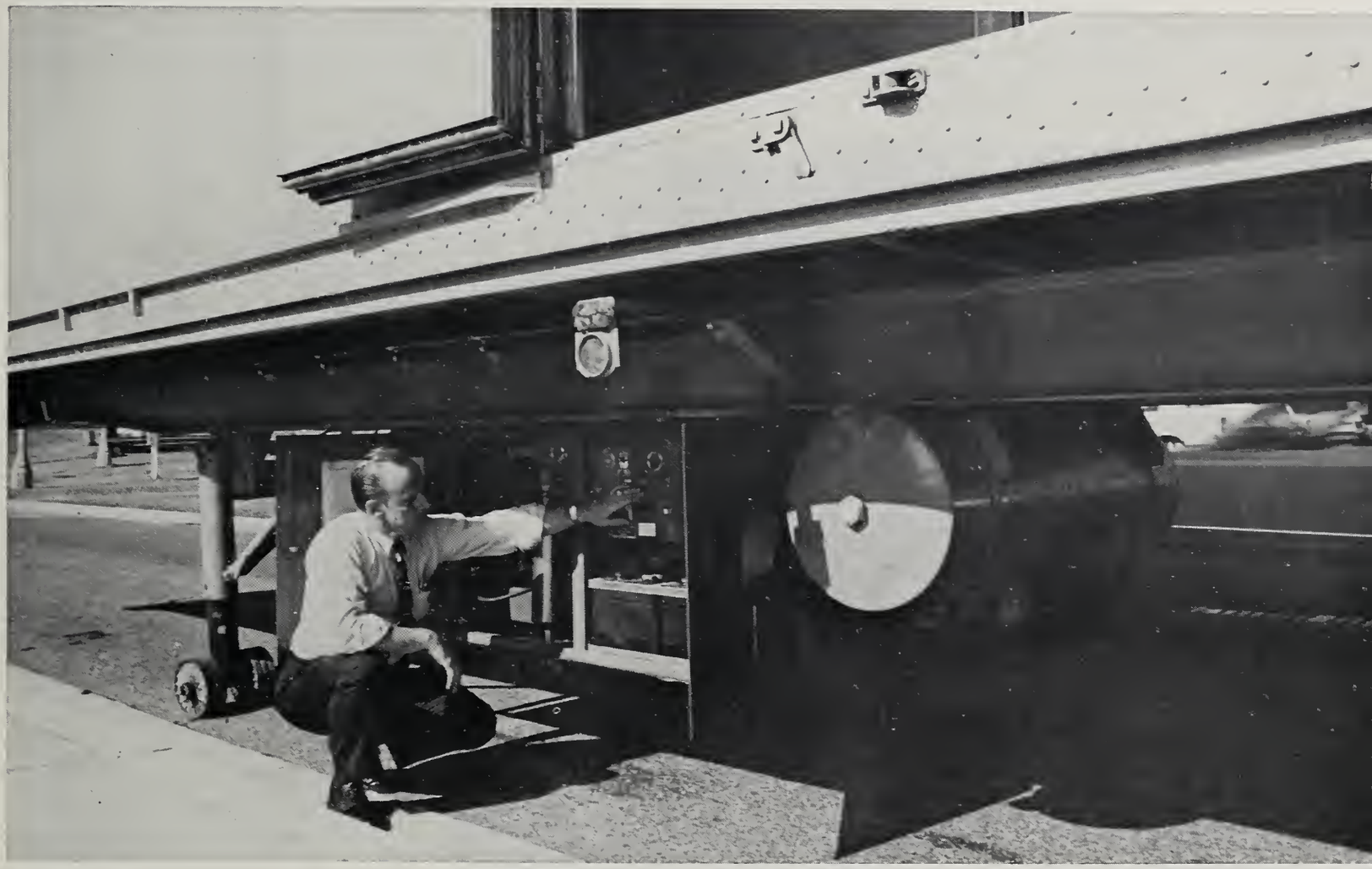


*Van container sits on trailer chassis. Underneath the chassis is the diesel-electric generator that supplies power for the refrigeration compressor. Goddard checks the control panel (1169A139–10).*

# coming

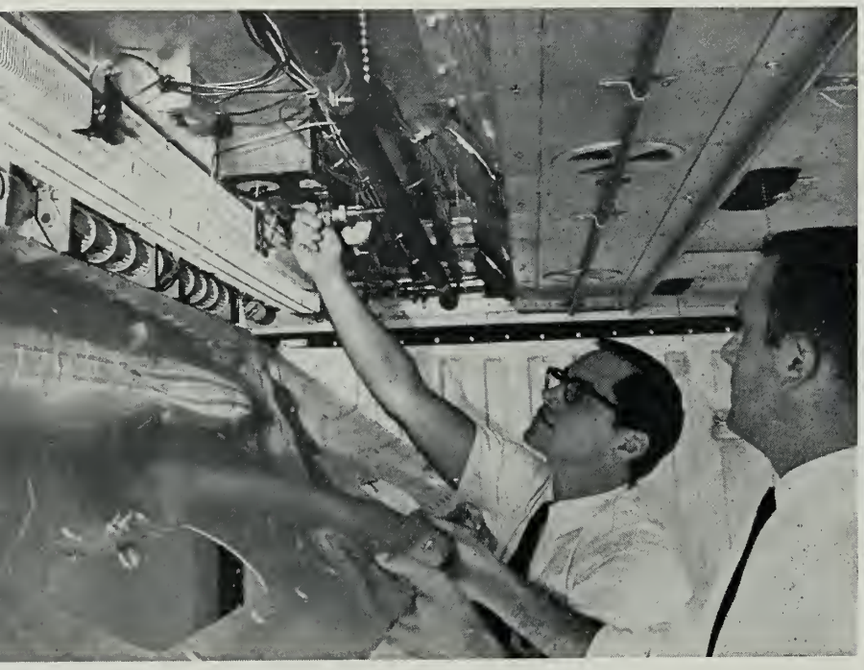
## . . . a versatile van container

A NEW DESIGN CONCEPT may improve and broaden the use of containerized shipping and save industry and consumers hundreds of millions of dollars annually.

ARS industry economist P. L. Breakiron and mechanical engineer W. F. Goddard, Jr., have developed a multi purpose van container system designed to be more economical, versatile, and flexible than any present system.

Conventional refrigerated van containers still have drawbacks, despite the many improvements over other distribution techniques. For example, the chassis and wheels and the power generator for the refrigeration unit add to shipping costs, which are based on weight as well as on volume. Also, the thermostat and cooling source are at the front end, and temperatures are unevenly distributed in the load. This results in freeze damage in the upper and back-end portions and inadequate cooling in

*Below: ARS industry economists J. P. Anthony, Jr., and R. C. Mongelli lower ceiling panel to observe the 10-foot refrigeration coil, the blower, and the controls (1169A138–14).* ***Right:*** *Anthony examines the refrigeration coil while Mongelli checks the air pump used to inflate seal around the removable partition (1169A137–21).*



other parts of the cargo. Only products requiring the same temperature can be transported in each container.

The new multipurpose van container could solve these problems.

An experimental model, built to the researchers' specifications, incorporates two unique features—one to reduce excess shipping weight and increase available space for the cargo, the other to provide a more precisely controlled environment within the container.

The model is designed so the container is a separate unit from the trailer chassis and wheels and the power source for the refrigeration unit. In practice, for example, the container would be loaded, placed on a trailer chassis and connected to the refrigeration power supply, then trucked to a final destination. Or, the truck would haul the container to a rail center where only the container would be transferred to a flat car, connected to the power unit and transported farther, perhaps to a seaport where the process would be repeated between the rail car and a ship for transit overseas.

Another key feature of the new system deals with temperature control and air distribution. Individual, independently controlled refrigeration heating units have been designed to accommodate 10-foot sections or zones within the container. In each zone, air is circulated from the refrigeration unit at the top of the container down behind the sidewalls and under the load at the floor, then up through the load to returns at the ceiling. This provides for uniform air distribution and regulated temperatures every 10 feet.

Removable partitions seal off the zones from each other, allowing the mixing of loads that require more than one temperature level. Each section can also be independently ventilated or fumigated.

The experimental model has shown the potential value and the feasibility of the system, and it will aid in developing a prototype multipurpose container system.

In future research, Breakiron and Goddard will be concerned with developing ways to refine and adapt the improved system to existing equipment. ■

# citrus oils . . . GUARD MILK QUALITY

For thousands of years, men have used delicate fruity essences to enrich costly, exotic perfumes and cosmetics and to flavor and preserve food. Today dairy scientists are discovering that these essences can increase the wholesomeness and keeping quality of milk and other dairy products.

No matter how carefully dairy products are processed, after pasteurization they can occasionally become recontaminated with low, hard-to-detect concentrations of *Salmonella* and other food-poisoning and spoilage bacteria. ARS researchers think that a new solution to this problem could be the post-pasteurization use of safe, natural microbial inhibitors such as the essential oils of orange, lemon, lime, grapefruit, or mandarin.

In tests at Beltsville, Md., with pure cultures of 33 types of *Salmonella*, ARS microbiologists Roger Dabbah and V. M. Edwards and chemist W. A. Moats found that 1,000 parts per million of terpineol—a component of essential oils—was 100 percent effective in inhibiting bacterial growth and killing *Salmonella*.

Commercially pasteurized skim milk with 1,000 ppm terpineol kept for up to 52 days at the usual 40° F. refrigeration temperature. Normally, milk keeps about 14 days.

Unfortunately, terpineol imparts an off-flavor in milk. The scientists are finding, however, that the essential oils themselves are almost as effective as terpineol against *Salmonella* growth. Essential oils also inhibit the growth of spoilage organisms, but to a lesser degree.

For instance, 1,000 ppm orange oil was from 92 to 100 percent effective in inhibiting growth when tested against the 33 types of *Salmonella*. The percentage of kill varied from 0 to 78 percent, depending on the type of *Salmonella* tested.

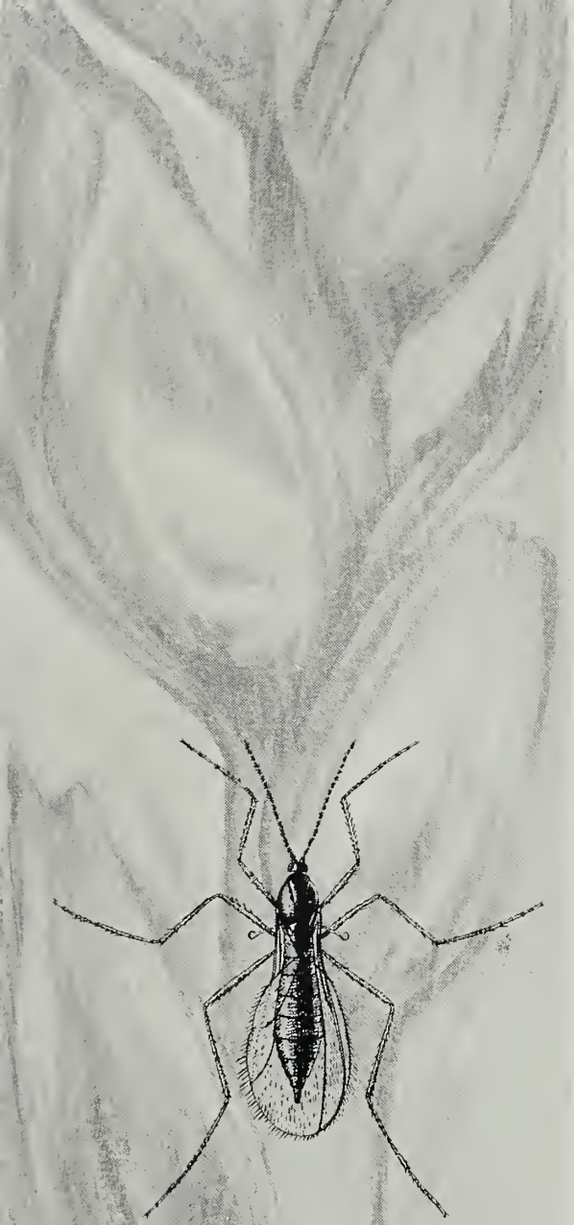
Dry-curd cottage cheese treated with orange oil kept fresh for 2 weeks—twice as long as cottage cheese without essential oils. And skim milk kept for about 50 days when treated with 1,000 ppm orange oil.

Taste tests show that the oils may actually improve the flavor of dairy products, particularly skim milk, and help them compete against imitation products.

In future work, the scientists plan to test different oil treatments on various simple and complex media to find out just what it is about essential oils that makes them so effective against bacteria.

Essential oils are approved by the Food and Drug Administration as additives for some foods. Their addition to milk and dairy products, however, has not been approved. ■

*Dabbah pipets orange oil into a glass of commercial skim milk. Instrument is called a sonic homogenizer (ST–5439–19).*



# the HESSIAN FLY
## ..... closer to checkmate

TWO OFF-BEAT WEAPONS are being aimed at Hessian flies in soft red winter wheat.

One experimental weapon is to interbreed several races of the flies to produce offspring that cannot survive on soft wheat. The other is to forecast and actually produce new laboratory races of flies before they develop in nature, and then have resistant wheat varieties ready by the time the new races become destructive. This cooperative work involves scientists of ARS and the Indiana Agricultural Experiment Station, Purdue University, Lafayette.

Six strains of Hessian flies now occur naturally in the United States—the Great Plains race, and races A, B, C, D, and E. The Great Plains race, predominant in *hard* red winter wheat-growing areas of western Kansas, cannot survive on most *soft* wheats grown east of the Mississippi River. The other races can survive there, in varying degrees.

When ARS entomologists R. L. Gallun and J. H. Hatchett crossed Great Plains flies with the five other strains, none of the progeny was able to attack soft wheats. The scientists are trying to find out why. Great Plains flies, both male and female, transmit this dominant genetic factor—inability to survive on soft wheat—to all their offspring. All the fly races are compatible, emerge at the same time, and show no preferences in mating.

If Great Plains flies can be reared in large numbers and released to mate with other strains, native fly populations could be suppressed or perhaps eradicated in isolated pockets of soft wheat where satisfactory resistant wheat varieties have not been developed. This is a new—and as yet untried—genetic application of the autocidal principle of pest control.

Hatchett theorizes that releasing 19 Great Plains flies to every one native fly should eradicate the wheat pests within four or five generations. Laboratory and caged field tests by J. E. Foster, Purdue graduate student in entomology, are proving Hatchett's mathematical model right. Now in the fourth generation, 19:1 releases are definitely reducing populations. Releases at a 4:1 ratio prevent buildups.

Foster is working out precise means of calculating fly populations in the field and developing release techniques. Tremendous quantities of Great Plains flies can be greenhouse-reared on wheat seedlings, and since the fragile, short-lived insects can't be released as adults, the infested seedlings would probably be distributed in wheat fields. If present tests continue promising, entomologists hope to make mass fly releases this year in isolated areas of Indiana.

The second approach is futuristic, but has proved very workable. Recently, Gallun and Hatchett showed genetically that, as with some other dipterous insects, all the inheritance the Hessian fly passes on is from the mother's side. This genetic find makes it possible to "build" new races in the laboratory before they develop in nature. Then, working with wheat breeders, the entomologists help develop resistant varieties by the time the new insect races appear in wheat fields in damaging numbers. Thus, the scientists have kept one jump ahead of evolving races of flies.

Races C, D, and E have evolved in nature during this decade. Theoretically, the only other new strains that can evolve while current sources of resistance in wheat germ plasm are being used are races F and G. They are now being developed under close confinement in the laboratory. ■

*Male corn borer moth reacts with typical mating response to fumes from sex attractant in eyedropper. Attractant was isolated from a female moth (PN–1835).*

researchers identify

# the call of the corn borer

ENTOMOLOGISTS have unraveled the physical and chemical properties of the European corn borer's sex attractant—opening the way for its synthetic production and studies of possible uses of the attractant in surveys or control.

Of 14 insect sex attractants identified by scientists, the borer's lure is the first one found identical to that of a species belonging to another family of insects. The attractant—*cis*-11-tetradecenyl acetate—is the same for both borers and red-banded leaf rollers. In earlier studies, New York State Agricultural Experiment Station scientists at Geneva identified the leaf roller's attractant.

ARS entomologists J. A. Klun and T. A. Brindley at Ankeny, Iowa, isolated the attractant from extracts taken from 3,000 female borer moths and subsequently determined its chemical identity. Iowa State University, Ames, cooperated in the research.

Exploratory studies indicate that neither the natural nor the synthetic lure attracts males for distances greater than 10 to 15 feet. This limitation in distance over which the lure is effective would determine the number of lure-baited traps needed for survey or control.

In laboratory studies at Ankeny, male borer moths exhibited the same response to both the synthetic and the natural lure. Klun and Brindley plan to test the insects' response to the synthetic lure in the field to approximate natural conditions more closely than possible in the laboratory.

They also plan to test the synthetic lure's potential as a mating inhibitor in a biological approach to pest control that disrupts the insects' normal behavior. Extended exposure of male moths to an atmosphere permeated with the synthetic attractant might satiate or dull their senses; consequently, the males would not respond to either the synthetic or the natural attractant.

Distribution of sufficient amounts of the synthetic lure over a given area might have a second effect, disorienting males seeking mates. This disruption of chemical communication between the sexes would result in mating inhibition and control of the borers.

The effect of other environmental factors on the insects' response to synthetic or natural lures will also be determined in field tests. ■

*Cover: Webb scoops up handful of experimental tomatoes (PN–1845).* ***Below:*** *Tomato harvesting machine along with its tractor-pulled trailer (ST–5371–33).* ***Right:*** *Close-up of harvester shows blade cutting off vines below the soil. Tomato plants move onto conveyor belt and are carried up into machine (ST–5371–27).*

# Eastern tomatoes shape up

On the lower slopes of the Andes in ages past, the small raisin-sized ancestors of today's tomatoes would scarcely be recognized. And man continues to exert his influence on the tomato as it catapults into this technological age.

Since 1960, when machine harvesting became a necessity to keep catsup on the family table, much has been accomplished. In 8 short years, processing tomatoes adapted to machine harvesting have become a reality, and in 1968 machines harvested an almost unbelievable 216,000 acres in California, representing approximately 4.4 million tons.

Now spreading east of the Rockies, machine harvesting has found ARS plant pathologist R. E. Webb ready. Because of climate differences and susceptibility to Eastern diseases, California tomatoes are not suitable for Midwest and Eastern growers.

Webb started his breeding program in 1962 and has successfully developed three varieties for machine harvesting. A round, disease-resistant variety for New Jersey-Pennsylvania growers, the most recent development by ARS, may be available in 1971. A specialty variety of the "half-long" type will also probably be ready for release in the next year or so.

A logical question, often asked, is: How are machine-harvested tomatoes different from hand-picked varieties? To answer, it is necessary to understand how a tomato harvester works.

Basically the harvester has a blade or similar device that cuts off the entire tomato plant—stems, leaves and fruit—about 3 or 4 inches below the soil line. The plant along with its fruit is carried by a conveyor belt up to a central area on the harvester where the ripe fruit is shaken from the vine. This is a crucial point in harvesting since the fruit must be firm and resilient enough to withstand considerable shaking and bumping. Size is also important—a 3- to 4-ounce tomato will not fall from the vine with the force of the usual 6- to 8-ounce tomato and thus will not split as easily.

Also important to machine harvesting is the breaking point of the stem holding the fruit to the vine. If the fruit, once shaken from the vine, retains any stump or portion of the green stem, it can and often does puncture its neighbors. Therefore, the fruit must break clean from the stem.

Webb is breeding in this quality.

In addition, the harvester covers a field only once, so a high percentage of the fruit must ripen at the same time and be carried on small, highly branched, high-yielding vines. Tomatoes must also ripen early and have the usual good flavor, meatiness, and attractive color.

Not only is the breeding program successfully achieving both the necessary and desirable characteristics for machine harvesting in the East, it is also achieving multi-disease-resistant stock. This, of course, means less loss due to plant diseases. Such varieties form an important part of an integrated pest control program that aids in reducing pesticide residues.

When asked, "What next?" Webb speculates that within the not too distant future most tomatoes—both fresh and processing—will find themselves bumping along a conveyor belt on a harvesting machine, then jostling down a highway in a 5-ton tomato dump truck, ending in a swim in a water bath and then onto another conveyor belt to "central sorting" with its fluorescent lighting and piped-in music—a far cry from the slopes of the Andes. ■

***Above:*** *ARS technician George Walter weighs tomatoes while Webb records data (ST–5371–10).* ***Right:*** *Usual tomato type (left) has stem joint that breaks, leaving stump to injure other tomatoes. Tomatoes at right show Webb's progress in breeding out the joint (PN–1836).* ***Bottom right:*** *Webb is also developing a "half-long" tomato suitable for artistic food arrangements—a highly marketable quality (PN–1837).*

# air blasts bag BOLL WEEVILS

EFFECTIVENESS of the USDA-Texas boll weevil control program in the Texas High Plains has created another, if lesser, problem.

That problem is gathering or sampling adult boll weevils, in now low-level infestations, to obtain estimates of the number per acre. When weevil numbers drop below 25 per acre, it is difficult to accurately estimate the population. In one test, for example, when weevils averaged 13 per acre, entomologists making a plant-by-plant inspection missed half of the weevils the first time over the field. And yet it is important to have accurate estimates of these low infestations not only to tell how effective control measures have been but also to project what populations to expect in later generations.

ARS researchers, trying to eliminate the costly and time-consuming by-hand monitoring of large areas of cotton are developing a machine that will make it possible to obtain reliable population estimates quickly and inexpensively. In a series of tests at College Station, Tex., the mechanical sampler got from 63 to 92 percent of the weevils.

ARS agricultural engineer I. W. Kirk, in cooperation with Texas Agricultural Experiment Station entomologist D. G. Bottrell, Lubbock, is basing the machine on the same principle as one sold as an insect control device in the 1940's. The machine sends an air stream across a row of plants to blow insects into a collection bag.

The machine, built on a double tool bar, is attached to a three-point hitch behind a row-crop tractor. Power to the machine's fan is supplied by the tractor's power take-off. The three-point hitch allows versatility in maneuvering the machine in various sizes of cotton.

Three factors—air speed, air temperature, and machine speed—were evaluated to determine the optimum operating levels for maximum collection efficiency and to determine an optimum setting for each factor. The air speed, generated by a multispeed booster fan, could be set at 8,000, 10,000, and 12,000 feet per minute. Air temperature, regulated by a 150,000 BTU LP gas-fired burner, could be increased up to 50° F. above that at the air outlet nozzles. Machine ground speeds were studied at 1, 3, and 5 miles per hour.

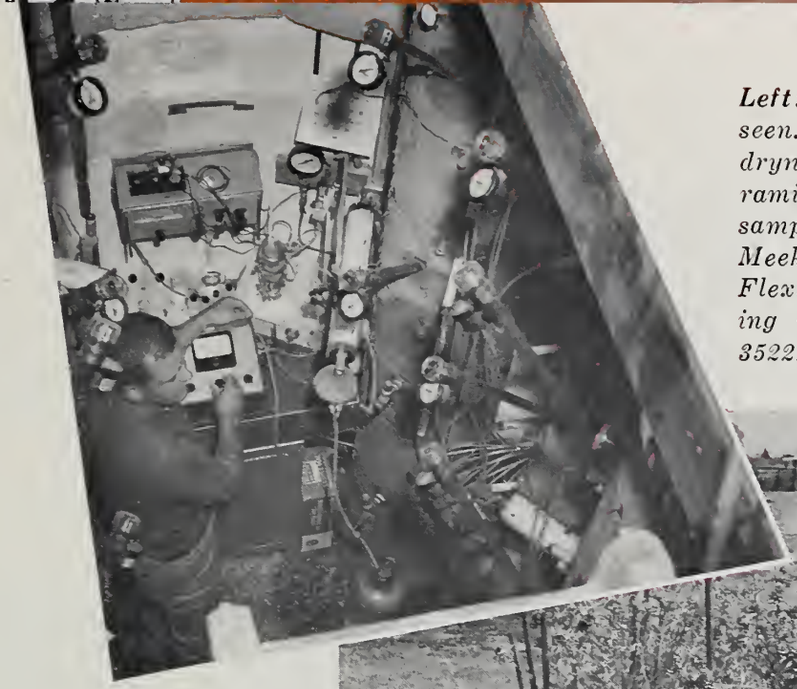
Tests show that the highest air speed (12,000 f.p.m.), highest temperature (existing temperature plus 50° F.), and lowest ground speed (1 m.p.h.) gave the best results. Air velocity, however, had the greatest influence in weevil collection, with air temperature and machine speed somewhat less important.

Built as a two-row machine, adjustments can be made to use it as a one-row device with both nozzles directed on the same row. Each nozzle discharges air across one row of plants into a collector funnel spaced 12 inches opposite the nozzle's opening. The collector entrance is 22 inches wide by 18 inches high and tapers back to a 10-inch round outlet holding a nylon screen bag.

Underway, the machine goes down a row with the air blast momentarily forcing the plants into the collector's entrance and blowing the insects into the bag.

Increased sampling efficiency was not obtained by passing the machine over a row of cotton a second and third time. ■

*Above: Weevil-collecting machine set for one row covers a cotton field (PN–1838). Right: Close-up of collector. Nozzles on left blow air stream across plants, forcing plants into collector's entrance and blowing weevils off plants into nylon bag at right (PN–1839).*



*Left: Inside lab, lower part of columns can be seen. Instruments with dial gages measure soil dryness. White tubes, connected to porous ceramic cups inside the columns, allow direct sampling of soil solution (BN–35222).* ***Below:*** *Meek enters lab. Crop in columns is safflower. Flexible gaskets around column tops seal opening while permitting column removal (BN–35221).*

# soil research aid . . .
# KINGSIZE COLUMNS

NEW JUMBO-SIZED soil columns are helping ARS researchers determine the movement of chemicals through soils.

Soil columns—tubes filled with representative samples of earth from a given area—have long been used by scientists to study the chemistry, water-holding capacity, and other features of soils. Ordinarily no more than a few inches in diameter and 3 or 4 feet in length, they are used chiefly as laboratory tools.

The new jumbo columns are 15 inches in diameter and 10 feet long. They are inside an 8-foot-wide below ground, temperature-controlled pit at the Southwestern Irrigation Field Station, Brawley, Calif. Instruments in the pit continuously record data from the columns, giving scientists a picture of soil activity that closely resembles natural conditions in fields.

At present, soil scientists B. D. Meek and L. B. Grass are using the columns to study iron and manganese in the soil solution. Under certain circumstances, these minerals plug tile lines and prevent efficient drainage of irrigation water—an unwelcome situation in California's Imperial Valley, where 14,000 miles of tile drains have been installed at a cost of $38 million.

Each of the six columns has been filled with Holtville silty clay and planted to safflower. Simulated tile lines have been installed at different levels in each column. The water table is maintained at 6 feet in all columns. Plastic tubing has been placed at 1-foot intervals to sample soil solutions at various depths, and electrodes in the soil columns sample oxygen content.

The researchers hope to find out which soil conditions inhibit deposition of iron and manganese in tiles, then develop practical methods for attaining these conditions in the field.

Soil nitrate content will also be studied in the new soil column laboratory. Nitrate is sometimes found in high concentrations in the effluent from field drainage systems. High nitrate concentrations are harmful in water because of algal growth. Studies will show whether the nitrate appearing in the drainage water can be reduced. ■

## *filling the blanks* / FREEZE BRANDING

HOW LONG will a freeze brand last?

ARS animal identification specialist N. W. Hooven, Beltsville, Md., says that freeze brands are as good after 3 years as after 6 weeks, if the brands are applied properly. Hooven is studying the effects of breed, age, anatomical location, season, time exposure, and refrigerants on the freeze brand to establish procedures for more effective use.

To develop these procedures, cattle are being branded at 3, 6, and 12 months of age and at 10, 20, and 30 seconds exposure time. The brands are applied on the neck, shoulder, rib cage, rump, and thigh areas of the body and in the spring, summer, and fall. Hereford, Angus, Brangus and Hereford-Angus crosses as well as purebred Holstein, Guernsey and Jersey cattle are being used. In the study, irons chilled in liquid nitrogen are applied on the left side of the animal, and irons chilled in dry ice and alcohol are applied on the right side.

Current results indicate that when dry ice and alcohol are used to chill the irons, the resultant brands are superior to liquid nitrogen brands. At similar time exposures, liquid nitrogen brands cause more extensive damage to hair follicles and hide. Additional experiments are being conducted with liquid nitrogen in an effort to reduce adverse effects.

In several recent experiments with liquid nitrogen, Hooven found that irons applied to unclipped animals appeared to produce a brand superior to brands made on coarse-clipped animals.

ARS introduced freeze branding 3 years ago (AGR. RES., June 1966, p. 8). The technique provides an easily seen brand for accurate identification—even at a distance—and reduces damage to the hide. Hot iron branding not only causes local hide damage, but extensive lateral damage as well—damage that costs the hide and leather industry an estimated $50 million a year.

However, freeze branding will cause hide damage if the exposure time is excessive. This will yield a "bald" brand, but this bald brand is necessary for making a visible mark on a white or light colored animal. There is no indication of lateral hide damage.

Cattlemen are also concerned that rustlers may dye the white hair resulting from a freeze brand to match the surrounding hair; i.e., the white freeze brand on an Angus steer could be dyed black, erasing signs of the brand. Since this is a possibility, Hooven plans to have several freeze-branded cattle slaughtered and their brands checked on the flesh side of the hide. He thinks the brand will be visible when it is candled using a technique similar to that used for candling eggs.

All cattle at Beltsville are freeze branded before 3 months of age, and Hooven says "there haven't been any failures yet." He believes freeze branding will become the best method of permanently identifying livestock. ■

*ST–4936–10*

# poison plant . . . pioneers the range

***Above left:*** *The invader plant silhouetted against Utah sky (PN–1840).* ***Above right:*** *A close-up (PN–1841).* ***Left:*** *Graduate student Lamon Arnold of Utah State University and A. H. Holmgren, Curator of the Intermountain Herbarium, examine plant specimen. They believe they have observed the plant in California and Nevada as well as Utah (PN–1842).*

A NEW POISONOUS PLANT, as yet not positively identified but promising nothing but trouble, is invading western rangeland at an alarming pace.

The plant was first spotted in the fall of 1964 on a ranch in northern Utah near the Idaho border. It occupied a small patch about 200 feet by 500 feet. Today that "patch" is 2 to 7 miles wide and about 30 miles long. The plant has appeared in two other areas in Utah—one site about 100 miles south of the original stand and the other only a few miles west. And two researchers of the Utah Agricultural Experiment Station believe they observed the plant growing in southern California, southern Nevada near Las Vegas, and in the southwestern corner of Utah.

The invading plant, which resembles Russian thistle and has some characteristics similar to halogeton, is very spiny and presents a formidable barrier to both animals and man after it is 6 to 8 inches high.

Plants analyzed last summer contained concentrations of soluble oxalates that would poison livestock. Fortunately, livestock normally pass up the plant because it is spiny and unpalatable.

The new plant is hardy and erect and appears to have a sturdier root and trunk system than Russian thistle, which breaks loose easily and rolls about in the wind. The plant has great vigor and chokes out well-established stands of shadscale, winterfat, and salt sage—important range shrubs for winter grazing. It is even crowding out Russian thistle, which can be grazed when it is young. Herbicides such as fenac and 2,4-D will kill the plant, but they also kill desirable shrubs and grasses.

ARS plant physiologist E. H. Cronin and Utah scientists think that if the plant isn't a new weed species or a hybrid, it may be a sport of Russian thistle. The new plant has 27 chromosomes versus 18 for Russian thistle.

Continued research will be concentrated on the taxonomy of the plant and on finding chemical, biological, or combination methods that will be selective enough to control the plant without damaging the desirable forage plants. ■

# TOPPING TOBACCO . . . chemically

*Maryland Catterton tobacco plants stripped of leaves show treated, sucker-free stalk (left) and untreated stalk with many suckers (BN–22720).*

EXPERIMENTAL STUDIES indicate that a new chemical may replace two laborious hand operations in tobacco production.

Tobacco growers now hand top the plants in late summer to promote full development of upper leaves adjacent to the terminal (flower) buds. About 2 weeks later, they remove suckers that subsequently develop along the stalk. If not removed, suckers would interfere with harvesting or curing operations. Producers spend as much as 10 hours an acre to top and sucker some types of tobacco.

Working in cooperation with the Maryland Agricultural Experiment Station at Upper Marlboro, Md., ARS plant physiologist G. L. Steffens and Maryland agronomist C. G. McKee inhibited both terminal and sucker growth with a single application of an emulsion of a fatty alcohol.

They applied 5 percent 1-decanol with a surfactant as a coarse spray over unopened buds. The scientists say that the spray must be applied before flowers open for complete bud inhibition. When the spray drained down along the entire length of the stalks, Steffens and McKee found that the suckers were also killed.

While the experiments were conducted with Maryland-type tobacco (Maryland 64 variety), the scientists believe 1-decanol should be equally effective with all types of tobacco.

Chemically topped plants yielded 2,105 pounds of cured leaf per acre, in contrast with 1.704 pounds from plants hand-topped and hand-suckered, and the return per acre was $1,169—$167 more than from conventional control.

Studies are continuing to ascertain the general feasibility of chemically topping and suckering tobacco in one operation under existing production practices. And new management systems and application techniques are under study in an attempt to improve the overall efficiency of the method. Research is also necessary to determine whether this process will result in any chemical residue in the harvested tobacco.

USDA has not registered 1-decanol for chemical topping of tobacco. ■

# Test pegs meat in sausage

TO HELP ASSURE that frankfurters and sausages are properly labeled, scientists have developed a test that could help inspectors identify the species of origin of heated meat.

The meat in most sausages is federally inspected before processing. When meat is cooked into sausages, however, almost all identifying proteins break down, making it almost impossible to tell one kind of meat from another.

At the request of Department meat inspection officials, ARS-sponsored scientists at the University of Illinois, Urbana, tackled the problem—one that has been stumping scientists for over 70 years.

Microbiologists A. B. Karpas, W. L. Myers, and Diego Segre, working in cooperation with ARS personnel, selected immunoglobulin G (IgG) as their test protein. Upon heating, IgG precipitates out, becoming trapped within the sausage tissue. IgG is the second most abundant serum protein (only albumin is more plentiful) and can be purified easily. More important, serum antibodies directed against IgG from one species will not readily react with IgG from other species.

The first step was to purify IgG from the whole sera of species most frequently used in sausages: chicken, cow, horse, sheep, swine. The purified IgG was heated to simulate sausage preparation, which caused most of the protein to precipitate out. The precipitate was used to produce a monospecific antiserum—a serum containing antibodies that would react only with antigens from the same species.

The reaction of the monospecific antisera against a specially prepared sample of an unknown heated meat is compared to responses of the antisera to known meat types.

Not only would this test enable inspectors to verify that sausage contains the type or types of meat it is supposed to contain; the test will also identify the species of meats making up as little as 25 percent of a mixture of three meat types in sausage.

Department inspectors are field-testing the new technique and plan to broaden its application to include species other than the five for which the test was designed. ■

# AGRISEARCH NOTES

## Closer Rows for Sugarcane

Stalk yields of sugarcane grown for sirup production were significantly higher with rows spaced 3 and 4 feet apart than with row spacings of 5 and 6 feet, which are commonly used by most growers.

ARS agronomist D. M. Broadhead at Meridian, Miss., and station superintendent T. E. Ashley at Poplarville, Miss., planted Cane C. P. 36–111 in rows spaced 3, 4, 5, and 6 feet apart on Ruston fine sandy loam. Three crops—plant, first stubble, and second stubble cane—were harvested from each of the rows about the first week of November. The resulting yields of cane decreased significantly as the space between rows increased. Sirup color, taste, clarity, and viscosity were not affected by the spacing.

The suppression of weed growth by shading was an additional advantage of the more closely planted rows.

## Virus Knocks Out Cabbage Loopers

An experimental biological control technique rescued a cabbage field from an invasion of cabbage loopers in recent field tests at Columbia, Mo.

ARS entomologists D. L. Hostetter and K. D. Biever sprayed the test plots with a water suspension containing nuclear polyhedrosis virus, which attacks cabbage loopers. Under optimum conditions, infected loopers stop feeding within 24 hours and die within 3 days.

In laboratory tests, Hostetter found the rapidly multiplying viruses taking over insect cells, disintegrating them and liquefying the insects. "In effect, the viruses represent parasitism at the genetic level," Hostetter noted.

Nature gives a helping hand in spreading the virus, Hostetter and Biever found in related field studies. English sparrows and sarcophagid flies spread virus particles to other plants and fields in their feces.

Some tests indicate, however, that ultraviolet radiation from the sun may alter the effectiveness of current formulations of this pathogen. This experimental virus has not been registered for commercial use.

## Sidelight On Birth Defects

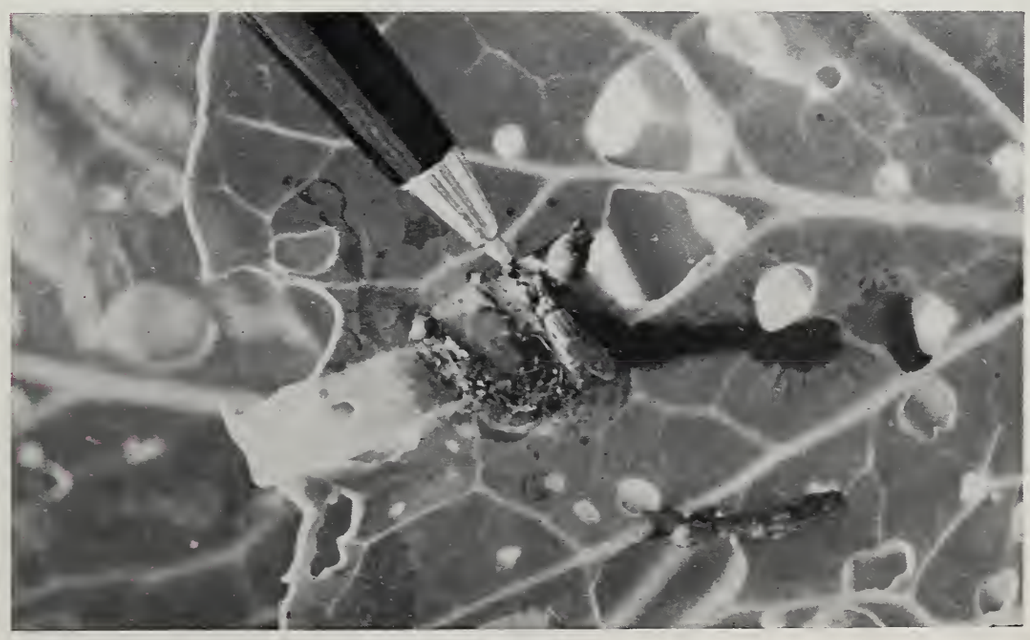
ARS scientists have discovered why cyclopia, a deformation of the heads in newborn offspring of ruminants, does not appear in the non-ruminant rabbit.

Cyclopia, a condition in which offspring have one central eye, appears in the newborn of ruminants such as sheep, goats, and cattle when the female eats a specific plant, western false hellebore (*Veratrum californicum*), during pregnancy.

ARS toxicologist R. F. Keeler at Logan, Utah, found that when he fed rabbits cyclopamine, the toxic compound in the plant that causes cyclopic young, along with a buffer to prevent stomach acid from affecting the compound, the rabbits had cyclopic offspring. However, when the buffer was not added with the cyclopamine, laboratory experiments confirmed that the stomach acid converted the cyclopamine to veratramine, a compound which had no affect on the new-born rabbits.

Poisoning in livestock caused by *V. californicum* can be a serious problem on western ranges. Scientists want to learn more about this toxic weed in the hope they may find an effective treatment for the poisoning. They are also seeking a possible relationship to malformations in the human, another non-ruminant.

*Sarcophagid fly consumes virus-killed looper, thereby spreading the disease to other plants (PN–1843).*



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**AGRISEARCH NOTES**

## Offset Sprinkler for Test Plots

Sprinkler irrigation research often involves large numbers of field plots and requires an irrigator designed to give uniform water application regardless of wind conditions.

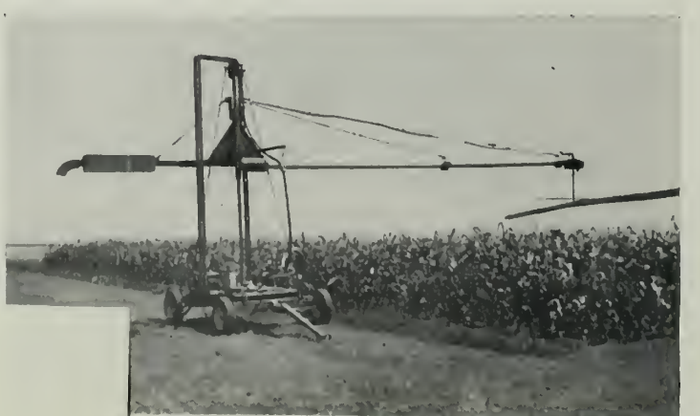
If an irrigator were highly mobile and could be used on many plots with little effort in moving, it would be doubly useful.

ARS researchers J. J. Bond and J. F. Power at Mandan, N. Dak., and North Dakota Agricultural Experiment Station agricultural engineer H. M. Olson at Carrington, N. Dak., designed and are using just such a plot irrigator. It consists of a stationary mast with a cantilevered boom on the mast. On one end of the beam is a rotating sprinkler boom and on the other, a counterbalance. The beam can be adjusted vertically for irrigating crops of different heights, and the offset mounting eliminates traffic on the plot.

In operation, the sprinkler is towed to the side of a plot with the sprinkler boom suspended over the center. One man can operate the sprinkler, and it does not have to be taken apart to move within a research area.

The sprinkler meters the water and applies it uniformly at controlled rates. Wind velocities as great as 20 miles per hour have not produced detectable wind distortion.

The prime disadvantage of the sprinkler is that water is applied in a circular pattern. Field plots must be large enough for all sampling to be within the circular irrigated area.



*Offset sprinkler is positioned at the side of field plots with the rotating sprinkler boom suspended over the crop (PN–1844).*

## Ozone Curbs Crown Rust

Crown rust, the most destructive disease of oats, was suppressed in laboratory fumigation chambers by ozone air pollution levels commonly surpassed in many areas.

Whether the effects of air pollution on crown rust are of economic importance under field conditions is yet to be determined. Crown rust, caused by the fungus *Puccinia coronata,* is particularly destructive in Southern and North Central States, often reducing yields 20 percent or more.

ARS plant pathologist A. S. Heagle found that rust pustules on oats were significantly smaller when plants were exposed to 10 parts per hundred million ozone for 6 hours in the light on the 10 days after infection. With equal numbers of plants, about half as many rust spores were produced in the ozone chamber as in one protected by carbon filters.

Exposure to 10 pphm ozone did not affect viability of spores. Spores produced on exposed plants germinated and penetrated stomates of oat leaves as well as spores produced on unexposed leaves.

Heagle says the suppression of crown rust may have resulted from action of ozone on the fungus, on the host plant, or a combination of these and other actions not determined. His studies at Cincinnati, Ohio, were in cooperation with the National Air Pollution Control Administration, Department of Health, Education and Welfare.

CAUTION: In using pesticides discussed in this publication, follow directions and heed precautions on pesticide labels. Be particularly careful where there is danger to wildlife or possible contamination of water supplies.

PROTECT
Use Pesticides Safely
FOLLOW THE LABEL



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